

Title: Method and device for sizing a crack in a workpiece using the ultrasonic pulse-echo technique

Patent Claims

1. A method for sizing a crack in a workpiece, more specifically the depth of a crack in said workpiece, using the ultrasonic pulse-echo method, said method involving the following method steps:
 - a workpiece has a front face and a back face, the workpiece has a crack that takes departure at the back face,
 - an angle beam probe is placed on the front face, it sends ultrasonic pulses at an angle α into the workpiece and receives echo signals of said pulses,
 - the angle beam probe is moved at least once across the crack so that the radiation beam of the angle beam probe sweeps across the entire crack,
 - the received echo signals are digitalized and stored in a memory as pairs of values echo signal over travel time with the stored pairs of values forming a quantity that is limited toward the top by an envelope curve,
 - the size of the crack is calculated from the width of the envelope curve at a predetermined partial amplitude and from the maximum amplitude of the envelope curve.
2. The method as set forth in claim 1, characterized in that, for every single value of the travel time of several echo amplitudes obtained, only the echo amplitude having the highest value is stored.
3. The method as set forth in claim 1, characterized in that the size of the crack is proportional to the product of the maximum amplitude of the envelope curve and the width of the envelope curve at 50 % of the maximum amplitude.

4. The method as set forth in claim 1, characterized in that the angle beam probe is a component part of an ultrasonic inspection apparatus, that said ultrasonic inspection apparatus further comprises a computer module and that said computer module outputs the flaw size as a value.
5. The method as set forth in claim 1, characterized in that the angle beam probe is moved several times across the crack, preferably back and forth.
6. A device for carrying out the method as set forth in claim 1 for determining (value measuring) a crack in a workpiece using the ultrasonic pulse-echo technique, said device comprising:
 - an angle beam probe that is a component part of an ultrasonic inspection apparatus which is further comprised of the following parts:
 - a) a transmitter module and a receiver module,
 - b) an A-D converter that is connected downstream of the receiver module,
 - c) a memory that stores in the form of pairs of values echo signals received from the transmitter module and digitalized by the A-D converter together with the respective travel time, only the highest echo amplitude obtained being stored for every single travel time and
 - d) a computer module that computes the depth of the crack from the maximum amplitude and from a width dimension of the envelope curve as stored.
7. The device as set forth in claim 6, characterized in that the ultrasonic apparatus comprises a monitor for displaying the envelope curve.